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GILL NET FISHERY OFF VERAVAL DURING 1982 - 1990

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Introduction

The fishery resources off Veraval are exploited intensively mainly by two gears, viz., trawl and gill nets. The gill net fishing with mechanised craft is in vogue since 1955 off Veraval. The gill net fishery has undergone changes by way of introduction of many out-board motorised canoes. It is imperative to monitor the effort, catch and catch composition under the changing pattern of exploitation to assess the resource vulnerable to gill net fishery and to quantify the contribution of the fishery to the total fishery so as to obtain a comprehensive knowledge of the fishery resource off Veraval.

The gill net catch in Veraval is landed at the old light house landing centre.

Two types of crafts, wooden and FRP dug-out canoes (with out-board engine) and plank-built boats (with in-board engine) are used for gill net fishing. *Kandari* (surface drift net; mesh size : 65-85 mm) and *Jada jal* (mesh size : 170-215 mm) are the gill nets used. In addition to these two nets, a specialized net *Dakkal* (surface or bottom drift net; mesh size : 140-160 mm) is used exclusively for pomfret during monsoon. The 3 types of nets are operated either from the OBM or from the IBM boats at a depth of 20-45 m. The fishing is conducted throughout the year with less intensity during monsoon. Mostly daily fishing is conducted and in few operations, the fishing extends for 2 - 3 days.

Results

Effort

During the 9 year period, the operation of OBM canoes increased from 18,482 units in 1982 to 26,476 units in 1990 (Table 1). On the other hand, the operation of IBM boats decreased from 9,211 units to 6,622 units. The crafts used for gill net operation, i.e. OBM and IBM vessels were used only as 'carriers' of nets, tackles, crew and catch and hence the difference in size and engine power among these crafts did not influence the catch. The area and time of operation was almost the same for both the types of vessels. As estimation of catch and catch rate separately for OBM and IBM vessels may mislead interpretation on the available resource, the catch data from both the crafts were pooled.

The catch depended mainly on the type of gear used. The gears had target fish groups and were seasonally employed according to availability of the resource. In a single operation, any of the 3 types of gears was used either individually or in combination. Hence, it was not possible to make gearwise assessment of the catch. Generally, each unit of OBM and IBM vessel operated 30 and 60 nets, respectively. In the present study, the effort was estimated based on the number of nets operated from each craft, irrespective of the type of craft.

The effort thus calculated did not vary much and ranged from 1,030,140 nets (1983) to 1,191,600 nets (1990) (Table 1) with an average of 1,099,660 ± 59,440 nets. The coefficient of variation was only 5.4%. It is clear that the effort has remained almost constant during the 9 years but the preference of craft for operation has

TABLE 1. *Effort of gill net operated from out-board motorised canoes and in-board motorised boats off Veraval*

	OBM		IBM		Total
Year	Units	Nets (OO's)	Units	Nets (OO's)	Nets (OO's)
1982	18482	5545	9211	5527	11071
1983	17854	5356	8242	4945	10301
1984	22516	6755	5930	3558	10313
1985	21425	6428	7923	4754	11181
1986	22728	6818	8168	4901	11719
1987	26349	7905	5695	3417	11322
1988	21700	6510	6705	4023	10533
1989	22827	6848	6274	3764	10613
1990	26476	7943	6622	3973	11916
Average	22261	6679	7197	4318	10997

shifted from IBM boats to OBM canoes. In 1982, an estimated 5,544.60 nets were operated from OBM canoes (Table 1), which formed 50% of the total nets operated; in 1990, the percentage of nets operated from the canoes increased to 67%. Lesser cost of hull, engine, fuel and other operational costs and easy maintenance are the main reasons for preference of OBM canoes over the IBM boats.

Catch and catch rate

The annual average catch and catch rate were 4,192 tonnes and 381.2 kg/100 nets, respectively. Though the effort remained almost constant during the 9 year period, the annual catch and catch rate fluctuated. The catch ranged from 2,842 tonnes (catch rate : 256.7 kg/100 nets) in 1982 to 6,165 t (catch rate : 517.4 kg/100 nets) in 1990. There was cyclic pattern in the fluctuations of catch and catch rate. During the period under study, distinctly high catch and catch rate were recorded during 1985 and 1986 and subsequently during 1989 and 1990 (Fig. 1). The gill net selects large sized fishes. The availability of the vulnerable age group of the stock, which may be affected by environmental, physiological or behavioural changes, may follow a cyclic pattern reflecting in the catch. (Ricker, W. E. 1958. *Bull. Fish. Res. Bod. Canada*, **119**, 300 pp.). However, when there are year-to-year variations in the distribution and availability of the stock, or in the vulnerability of the stock as affected by weather or age composition, it is not easy to distinguish the real changes in the population parameters (Gulland, J. A. 1955. U. K. Ministry Agr. & Fish., *Fish Invest.*, **18**, 46 pp.).

Catch composition

Fishes belonging to 10 groups formed about 98% of the gill net fishery. Of the 10 groups, elasmobranchs dominated the fishery forming 20.3% of the catch, followed by clupeids, seerfish and dorab (Fig. 2).

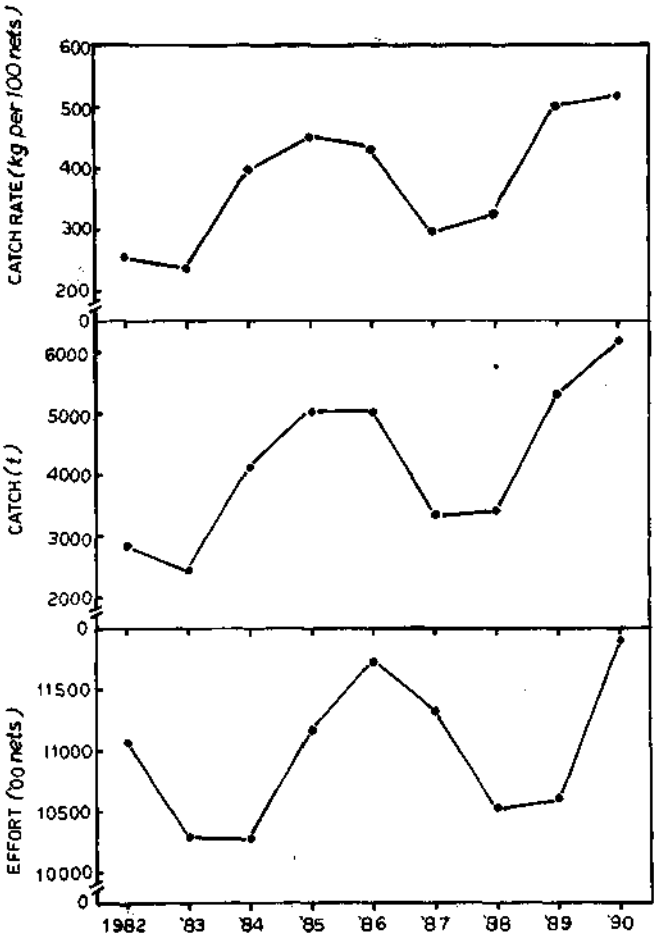

Fig. 1. Annual gill net effort, catch and catch rate off Veraval during 1982 - 1990.

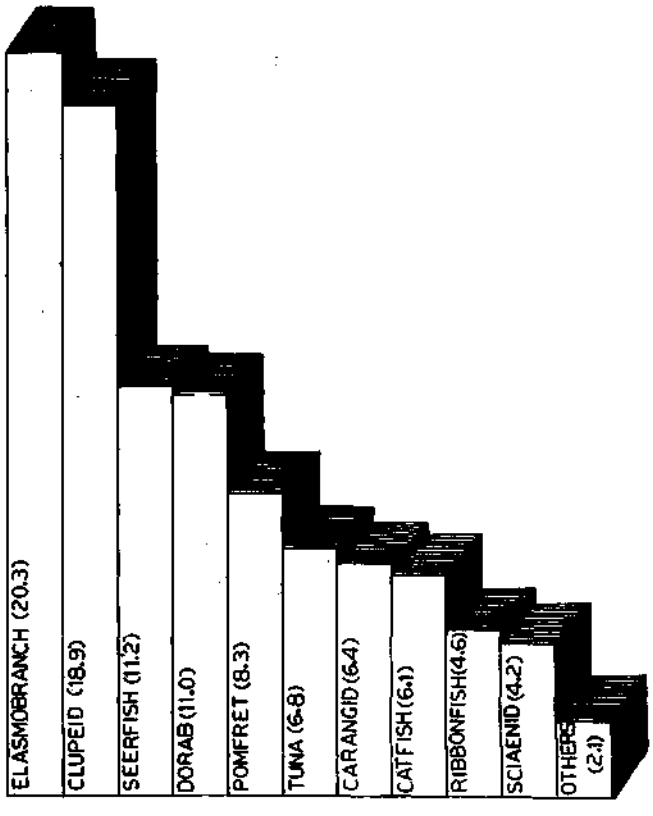

Fig. 2. Catch composition of different fish groups in the gill net landings in Veraval; figures in parentheses are percentage of total landings for the years 1982 - 1990.

TABLE 2. *Landings (tonnes) of different fish groups from gill nets in Veraval*

Group	1982	1983	1984	1985	1986	1987	1988	1989	1990	Average
Elasmobranch	670	327	621	745	622	444	679	740	2,796	849
Ribbonfish	116	96	250	244	395	281	61	164	132	193
Tuna	68	65	269	355	204	211	310	610	490	287
Seerfish	284	307	533	728	631	324	377	672	362	469
Carangid	177	73	197	342	346	257	200	509	317	269
Catfish	162	179	169	339	413	139	225	393	295	257
Clupeid	677	655	1,314	1,038	103	689	508	565	652	792
Sciaenid	84	78	170	198	162	71	162	365	310	178
Pomfret	266	199	171	344	575	333	428	503	318	349
Dorab	310	436	353	616	603	564	346	680	236	461
Others	27	43	74	91	41	40	106	120	258	89
All fish	2,842	2,459	4,121	5,039	5,023	3,353	3,402	5,321	6,165	4,192

The landings of most of the fish groups was high during 1985 & 1986 and 1989 & 1990. The landings of elasmobranchs, for instance, was high during 1985, 1989 and 1990; that of seerfish during 1985, 1986 and 1989 and that of pomfret during 1986 and 1990 (Table 2). Similarly, catch rates were also high for most of the groups during 1989 and 1990 (Table 3). The catch rate of elasmobranchs was very high in 1990 (234.6 kg/100 nets), which was due to unusually heavy landings of *Carcharhinus melanoptera* in April, 1990. Nevertheless, the uniformity in abundance of the different fish groups during those specific 4 years further stresses the cyclic pattern of occurrence of the population attaining age group vulnerable for gill net fishery. In spite of the fluctuations, the following 3 fish groups exhibited consistently increasing trends in catch and catch rate during the 9 year period; i) the tuna catch increased from 68 t in 1982 to 490 t in 1990; ii) the sciaenid (mostly 'ghol') from 84 t to 310 t; and iii) the carangid from 177 t to 317 t.

Seasonal variation

Gill net fishing is conducted throughout the year with less intensity during southwest monsoon. The operation of OBM canoes, especially, is very much restricted during June-August. The total effort is maximum in January and May. However, the total catch was maximum in September (4,925 t) followed by April (4,039 t) (Table 4). Barring clupeids, the catches of all the other groups were maximum during August-September, i.e. during the last phase of monsoon. The high landings in April was due to unusually heavy landings of *C. melanoptera* in April, 1990.

TABLE 3. *Catch rate (kg/100 nets) of different fish groups in the gill net operated off Veraval*

Group	1982	1983	1984	1985	1986	1987	1988	1989	1990	All year
Elasmobranch	60.5	31.8	60.2	66.7	53.1	39.2	64.4	69.8	234.6	77.2
Ribbonfish	10.5	9.4	24.3	21.8	33.7	24.8	5.8	15.5	11.1	17.6
Tuna	6.2	6.3	26.1	31.7	17.4	18.6	29.4	57.5	41.1	26.1
Seerfish	25.7	29.8	51.7	65.1	53.8	28.6	35.8	63.3	30.4	42.6
Carangid	16.0	7.1	19.1	30.6	29.5	22.7	18.9	47.9	26.6	24.4
Catfish	14.6	17.4	16.4	30.3	35.2	12.3	21.3	37.0	24.7	23.4
Clupeid	61.1	63.6	127.4	92.8	88.0	60.9	48.3	53.2	54.7	72.0
Sciaenid	7.6	7.5	16.5	17.7	13.8	6.2	15.4	34.4	26.0	16.2
Pomfret	24.0	19.3	16.5	30.8	49.1	29.4	40.7	47.4	26.7	31.7
Dorab	28.0	42.3	34.3	55.1	51.5	49.8	32.9	64.1	19.8	41.9
Others	2.8	4.1	7.1	8.2	3.5	3.5	10.1	11.3	21.6	8.1
All fish	256.7	238.7	399.6	450.7	428.6	296.2	323.0	501.4	517.4	381.2

TABLE 4. *Monthwise total landings (tonnes) of different fish groups and total effort of gill net during 1982 - 1990*

Group	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Elasmobranch	440	712	567	1731	879	412	180	441	1092	245	388	559
Ribbonfish	140	124	269	183	112	32	4	26	208	381	146	115
Tuna	180	47	164	400	296	5	2	40	527	480	150	291
Seerfish	434	441	270	136	53	10	5	86	817	823	751	392
Carangid	84	135	124	185	215	157	49	190	614	293	206	166
Catfish	232	212	200	168	253	211	87	176	255	91	231	197
Clupeid	948	728	506	586	693	178	90	493	439	539	679	1252
Sciaenid	199	155	98	159	218	122	16	59	67	85	257	164
Pomfret	89	76	53	100	570	286	526	838	380	67	71	80
Dorab	421	455	499	334	136	34	21	548	441	480	408	372
Others	102	76	55	58	129	47	5	3	85	69	99	74
All fish	3,270	3,160	2,804	4,039	3,553	1,494	986	2,901	4,925	3,553	3,386	3,663
Effort '00 nets)	10,251	9,034	9,662	9,780	11,029	4,550	3,012	6,458	8,540	9,108	8,908	8,637

The catch rates of all fish and most of the fish groups were also maximum during September and October (Table 5). The catch rate of pomfret was maximum during the peak monsoon months, when *Dakkal* was operated by most of the vessels.

Remarks

The fishery resources off Veraval is intensively exploited by gill net and trawl net. Introduction of new trawlers every year is shifting the pattern of exploitation towards trawls. During 1982-1990, the annual gill net effort was almost stagnant; the catch and catch rate of most of the fish groups have fluctuated with a cyclic pattern. This is in contrast to the trawl fishery off Veraval. Critical analysis of data on the gill net and trawl fishery reveals that the ratio of gill net catch : trawl catch is shifting towards trawl catch in recent years. For instance, the gill net : trawl catch ratio was 1:8 in 1985 and the ratio has changed to 1:13 in 1988, 1989 and 1990. The gill net selectively exploits large size fishes and the small ones of most of the fish groups exploited by the gill net are caught by the trawl net (with exceptions like tuna). In such a situation, increase in effort and catch of one gear (trawl) may affect the future catch of the other gear (gill net) and thus, in a sense, the two gears may be said to 'compete' (Ricker, 1958 *Op. cit.*). Though this type of competition is considered normal and inevitable, it is necessary that a balance in exploitation ratio is maintained between the two gears (Widrig 1954, *Copeia*, 29-32). A balanced exploitation ratio has not been established so far for the fishery off Veraval. However, as the trend of gill net fishery off Veraval has not indicated any stress on trawl fishing, the present exploitation ratio appears to be balanced.

TABLE 5. *Monthwise catch rate (kg/ 100 nets) of different fish groups in the gill nets operated off Veraval during 1982 - 1990*

Group	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Elasmobranch	42.9	78.8	58.6	177.0	79.7	90.6	59.9	67.2	127.8	26.9	43.5	64.7
Ribbonfish	13.6	13.8	27.8	18.8	10.1	6.9	1.3	4.0	24.4	41.8	16.4	13.3
Tuna	17.6	5.2	17.0	40.9	26.8	1.2	0.5	6.2	61.7	52.7	16.8	33.7
Seerfish	42.4	48.8	27.9	13.9	4.8	2.3	1.7	13.2	95.7	90.3	84.4	45.4
Carangid	8.2	14.9	12.8	18.9	19.5	34.4	16.2	29.0	71.9	32.2	23.1	19.2
Catfish	22.6	23.4	20.7	17.2	23.0	46.3	29.0	26.9	29.8	10.0	25.9	22.9
Clupeid	92.5	80.6	52.3	59.9	62.8	39.2	29.7	75.1	51.4	59.2	76.2	144.9
Sciaenid	19.4	17.1	10.1	16.2	19.8	26.9	5.4	9.0	7.8	9.3	28.8	19.0
Pomfret	8.7	8.4	5.5	10.2	51.7	62.8	174.6	127.7	44.5	7.4	8.0	9.3
Dorab	41.1	50.4	51.6	34.1	12.3	7.5	7.1	83.6	51.7	52.7	45.8	43.1
Others	9.9	8.4	5.6	5.9	11.7	10.3	1.7	0.4	9.9	7.6	11.1	8.6
All fish	319.0	349.8	290.2	413.0	322.1	328.4	327.2	442.3	576.7	390.0	380.1	424.1